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BIOLOGICAL EVALUATION OF FLAT ROCK AND HOWELL TIMBER SALES AND HORSE TROUGH RIDGE ON THE CORNING RANGER DISTRICT, MENDOCINO NATIONAL FOREST

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ABSTRACT

Three areas on the Corning Ranger District were examined for pest-related damage. Black stain root disease was causing the death and decline of Douglas-firs in a precommercially thinned stand on Horse Trough Ridge. Only a small area of the stand was affected and specific measures to suppress the disease are not recommended. The Flat Rock timber sale is in an area of old growth red fir and includes Wells Cabin campground. Little pest activity was evident. Some trees had indications of decay of their butt logs. Fomes annosus conks, cause of annosus root disease, were found in a few red fir stumps, but no above ground damage was visible. Pocket gopher activity was present in openings and grassy areas. Hazardous trees, with butt decay or multiple tops, were present in the campground. Borax treatment of freshly cut stumps is advisable in the sale because of the recreation emphasis of the area. The current silvicultural prescription for the stand is appropriate from a pest management standpoint. More specific objectives need to be developed for the campground. The third area examined was the Howell timber sale. Some windthrow of white fir had been caused by annosus root disease. Because of the small amount of disease and the planned regeneration with a majority of ponderosa pine, borax stump treatment is not required. Closer examination of the stand is suggested to determine the acceptability of planting Douglas-fir on this site.

INTRODUCTION

At the request of the Mendocino National Forest, I met with Tom Henry, Silviculturist, Corning Ranger District, on July 31, 1985 to examine several planned timber sales. During the visit, three situations were examined: declining Douglas-firs in a precommercially thinned stand on Horse Trough Ridge, Wells Cabin Campground and the associated Flat Rock sale, and the Howell sale. Because of the differences between these situations, each will be discuseed separately. Biological information on each of the pests discussed is presented at the end of this report.

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Horse Trough Ridge

This stand of ponderosa pine, Douglas-fir, and California black oak was pre-commerically thinned in 1984. During the thinning operation, a group of dead and declining Douglas-firs was observed in one area of the plantation. The symptoms ranged from some needle loss and yellowing to tree mortality. The symptomatic trees were located along a haul road from the original harvesting of the stand.

Examination of the roots and boles of these trees revealed typical symptoms of black stain root disease, caused by Ceratocystis wageneri. It appeared that at least two root disease centers were present, although the distribution of healthy and symptomatic trees reduced the distinctiveness of each center. This was the only known area of black stain root disease in the stand.

Because of the limited effect of the disease on the stand, a reasonable and practical action is to continue with the existing silvicultural prescription. Although it might be possible to suppress the disease by removing Douglas-firs from the centers and a 75-foot-wide buffer strip surrounding the centers, the number of trees removed would probably be more than what will be lost from the disease. The cost of such an action for such a limited area would likely be prohibitive for any benefit to be gained. Based on observations in similar situations, the disease centers are expected to become no more than 0.1 to 0.2 acres in size. As the centers become more open, ponderosa pine may naturally regenerate.

In other stands with Douglas-fir that are to be precommercially thinned, it is advised that they be examined closely for the occurrence of black stain root disease, primarily along areas of previous soil disturbance. If the disease is discovered, then infected trees can be removed during the thinning and non-host trees can be favored within and immediately around the disease centers.

Flat Rock Timber Sale

This 200-acre area is proposed for a timber sale. Within the sale boundary is the Wells Cabin campground of 25 units. The stands comprise mature to over-mature red fir with scattered white fir and sugar pine. They are multiple-layered stands, generally well-stocked, with little to no brush, and interspersed with a few, small grassy openings. The District is considering a combination of patch cuts and partial cuts, including shelterwood and overstory removal, outside of the campground. Within the campground, overall objectives are to improve tree health and vigor and provide an attractive recreational setting, although more specific stand management objectives have not been established.

Outside of the campground, the trees are relatively healthy. In some parts there does appear to be substantial butt decay. This is based on visible decay in some trees and some trees with large butt swells. Old fire scars were the entry point for much of this volume loss. The silvicultural prescriptions being developed for these stands, patch cuts and partial cuts, appear appropriate from a pest management viewpoint. Because of the proximity to the developed recreation area and the projected increased use of this campground and the surrounding area, it may be advisable to treat all freshly cut conifer stumps with borax (sodium tetraborate decahydrate) during the sale. This

treatment is 95% effective in preventing infection by Fomes annosus, a root disease fungus. Conks of F. annosus were seen in old stumps in the area, although there was no evidence of above ground damage. Treatment of stumps in the entire sale would reduce future effects of this root disease in this recreation area.

The 25 unit Wells Cabin campground receives limited, seasonal use, but use is projected to increase. The vegetation includes aggregates of large sawtimber-size red fir, sapling to pole-size red fir, and openings with little to no regeneration. There is very little brush to provide screening between units, although dense thickets of small red fir accomplish this in certain places.

Two potential pests were found in the campground. F. annosus conks were found in some fir stumps, but there was no evidence of above ground damage. Mounds from pocket gopher (Thomomys sp.) activity were evident, primarily in openings and meadows, but there was no evidence of any impact on the existing vegetation. A third potential problem in the campground was hazard trees, a common occurrence in this type of red fir stand. Trees with butt rot or multiple tops were identified.

MANAGEMENT ALTERNATIVES

1. No Action. The condition of the stands will slowly deteriorate. Additional volume will be lost from the butt logs from decay. Natural regeneration will slowly invade the openings, although gophers may limit some success. Dense thickets of pole-size trees will stagnate from competition. Some tree failures may occur in the campground, especially during the winter. The overall health of the trees will remain about the same for the near future, but overstocking in some aggregates may combine with future droughts to stress some trees and increase their susceptibility to successful insect attacks, especially by fir engraver (Scolytus ventralis) and flatheaded fir borer (Tetropium abietis).

2. Integrated Pest Management. The overall objective would be to maintain pest-caused damage at acceptable levels while these stands are managed for their timber and recreational values. The general forest stands would be treated according to the proposed silvicultural prescriptions with a combination of patch cuts and partial cuts. Within the campground, site-specific objectives need to be developed so that proper silvicultural prescriptions can be devised to achieve these objectives. A number of treatments would likely be necessary depending on the specific site. This includes: 1) thinning dense thickets for release; 2) release of understory from overmature or hazardous overstory; 3) regeneration of openings and sparsely stocked areas; 4) regeneration of brush, if available, for screening; and 5) thinning of overstory to remove hazardous trees and promote stand vigor.

As part of this vegetation management plan, two specific pest management measures should be considered for implementation.

a) Borax stump treatment - Regional direction (FSM 2305 and 2331.33 R5 Supp. 90) requires the application of borax to all freshly cut conifer stumps in developed recreation areas to prevent infection by F. annosus. As stated

above, because of the proximity of the sale area to the campground, it is advisable to extend this treatment to the entire sale.

b) Pocket gopher control - Red fir regeneration is very susceptible to attack by pocket gophers, especially when grassy openings are nearby to provide habitat. Several control measures are available to minimize their impact to regeneration.

1) Habitat manipulation is a method in which the environment is altered to make it less suitable for gophers. Habitat manipulation should be done prior to regeneration efforts so that the gopher population is reduced before seedlings are planted. This treatment requires the removal of grasses and forbs from the area of concern. Oftentimes, followup treatment with baiting is necessary if gopher numbers are large.

2) Baiting. Use of a mechanical burrow builder in the campground is probably not practical. It may be considered outside of the campground if sufficient area needs to be treated. Hand baiting with strychnine-treated grain bait placed in gopher burrows is a practical and effective method of direct control. Control is most effective when there is fresh mound-building activity and when soil moisture is adequate to prevent collapse of the burrows. These conditions usually occur during late fall and early spring. This method could be safely used when the campground is open, but would probably be best used when the campground is closed. Because the bait is placed underground and most gophers die in the burrow system, secondary poisoning and nontarget hazards are minimal.

Howell Sale

This is an approximately 60-acre, old growth stand of white fir and ponderosa pine with some incense-cedar. The principal brush species is whitethorn. The silvicultural prescription is to clearcut much of the stand and regenerate with ponderosa pine, Douglas-fir, and a little white fir. The District was primarily concerned about annosus root disease and how it might affect the management of this stand and similar stands.

This is generally a healthy stand. Some annosus root disease was found in the white fir and had caused windthrow, but considering the age of the stand and the large proportion of white fir, there was relatively little disease compared to other such stands in the state. There was evidence of considerable pocket gopher activity in grassy areas around the boundary of the stand near the road.

The principal question was whether it was necessary to treat freshly cut stumps with borax. Because F. annosus was found at a low level and only in white fir, and the principal species to be regenerated are ponderosa pine and Douglas-fir, borax treatment is not necessary. The best evidence at this time indicated that infections in white fir do not cross over to pine. Therefore, any pine regeneration would not be affected in this stand. Douglas-fir rarely seems to be affected by annosus root disease and we have no evidence that indicates cross over from white fir to Douglas-fir occurs either.

The amount of pocket gopher activity in and around the sale area would indicate that control measures may be necessary. Some vegetation management, especially of the grasses, may be beneficial prior to regeneration attempts. This would

also benefit the seedlings because of reduced competition. Baiting in the late fall or early spring would also be effective, either by hand or with a mechanical burrow builder, as discussed above.

One question that arose from the evaluation was the appropriateness of regenerating Douglas-fir on this site. A few Douglas- firs were observed in surrounding stands, but they were a small component. Additional examination of the stand to determine if Douglas-fir is a species that is proper for this site is advised. It may be appropriate to reduce the amount of Douglas-fir planted and increase the amount of white fir.

Forest Pest Management is available to provide input for other areas of the Forest where there are questions. From examination of specific sites, we can provide pest management alternatives as input to silvicultural prescription development.

PEST BIOLOGIES

Black Stain Root Disease

Black stain root disease is caused by the fungus Ceratocystis wageneri (asexual state Verticicladiella wageneri). In California, the fungus has three host-specific strains that infect either ponderosa and Jeffrey pine, singleleaf pinyon pine, or Douglas-fir. In most situations, the fungus does not cross-over between species, even in mixed species stands.

Initiation of disease centers probably occurs when spore-carrying, cambium-feeding beetles invade tree roots. These beetles feed on and invade tree roots, whereupon they transmit the spores of the fungus to the tree. The fungus then grows in the wood of the root toward the root collar.

Once the fungus becomes established, it spreads locally between trees. Between-tree transmission is through rootlet contact or fungus growth through the soil for short distances and direct infection of small feeder roots. The rate of underground spread in a ponderosa pine stand is highly variable and dependent on species composition, stand density, and site; on the Georgetown Divide, El Dorado County, the average annual radial spread was 4 feet (range 0 to 20 feet). The rate is not substantiated for Douglas-fir, although it appears to be faster than in pine.

The disease can be identified in a tree by the dark brown to black stain of the wood. This stain occurs as arcs that correspond with the annual rings. The stain may occupy very little to most of the circumference of the tree and may be from one to many annual rings deep.

Infected trees undergo gradual to rapid crown decline prior to mortality. Symptoms of crown decline include reduced terminal growth, needle yellowing and shortening, and premature loss of foliage. Trees pole-size and larger may also bear a heavy cone crop. Bark and engraver beetles can successfully attack and kill infected trees. Douglas-firs may have grayish-blue resin streaming from the bark above the stained area.

Little information is available on stand and site characteristics associated with the disease. On the Georgetown Divide, pure or predominant ponderosa pine stands with moderate to high stand densities had a higher probability of being infected. The disease appeared to be limited to an elevational band of 4000 to 5000 feet. A characteristic of the disease in Douglas-fir is its higher incidence along roads and in young plantations or dense natural regeneration.

Annosus Root Disease of True Fir

Fomes annosus is a fungus that attacks a wide variety of woody plants. All western conifer species are susceptible. Madrone (Artemisia menziesii), and a few brush species (Arctostaphylos spp. and Artemisia tridenta) are occasional hosts. Other hardwood species are apparently not infected. The disease has been reported on all the National Forests in California, with incidence particularly high on true fir in northern California campgrounds. Incidence is somewhat higher in older, larger fir stands and in stands with high basal areas (over about 330 square feet/acre).

During periods favorable to the fungus, fruiting bodies (conks) form in decayed stumps, under the bark of dead trees, or under the duff at the root collar. New infection centers begin by aerial spread of spores produced by the conks and subsequent colonization of freshly cut stump surfaces or wounds on living trees. The fungus then spreads through root contacts into the root systems of adjacent live true fir. Local spread of the fungus from a stump typically results in the formation of a disease center, with dead trees in the center and fading trees on the margin. These centers usually continue to enlarge until they reach natural barriers such as stand openings or non-susceptible plants.

In pines, F. annosus grows through root cambial tissue to the root crown where it girdles and kills the trees. In less resinous species such as true firs, the fungus sometimes kills trees, but more frequently it is confined to the heartwood and inner sapwood of the larger roots where it causes a chronic butt and root decay and growth loss. Thus, while infection in true fir usually does not kill the host, it does affect its growth and thriftiness. Losses in true fir from F. annosus are mainly the result of windthrow resulting from root decay, and reduced root systems which predispose trees to attack and eventual death by the fir engraver beetle. Field observations suggest that vigorous young firs are usually able to regenerate root tissues faster than they are lost to the root disease. But when true firs slow in growth because of stand and/or site conditions, root development decreases to where there is a net loss in roots and the trees slowly decline due to the gradual loss of their root systems. This decline may take 10 to 20 years before tree death occurs.

In general, infections will cross from roots of pine to roots of true fir; however, rarely is the fungus observed to cross from true fir to pine. At higher elevations where pine and true fir are intermixed, F. annosus is commonly found only on true fir and mortality rarely includes both species within an infection center.

Pocket Gopher (Thomomys sp.)

Pocket gophers live in closed burrow systems and spend most of their time below ground. The crescent-shaped mounds and plugged burrow entrances are major signs of gopher presence and activity. These animals are solitary except during the breeding season and when young are being raised. Pocket gophers eat succulent underground parts of plants, although they may graze above ground on plants near burrow openings. Breeding occurs in early spring when green forage is plentiful, and litters of 4 to 8 young are born after a gestation period of 18 to 19 days. An annual turnover of more than 75 percent of the population is common. Young disperse, usually above ground, in late summer. Mound-building activity is most common during the late summer or early fall when young are dispersing and establishing their own burrows and adults are enlarging their systems in preparation for winter. Pocket gophers are active year round and even burrow through snow. Where preferred forbs and grasses are lacking, pocket gophers may feed on the roots of large trees.